Cole-Parmer

StableTemp

1100°C Box Furnace

Models: CBF Series

Installation and Operation Manual

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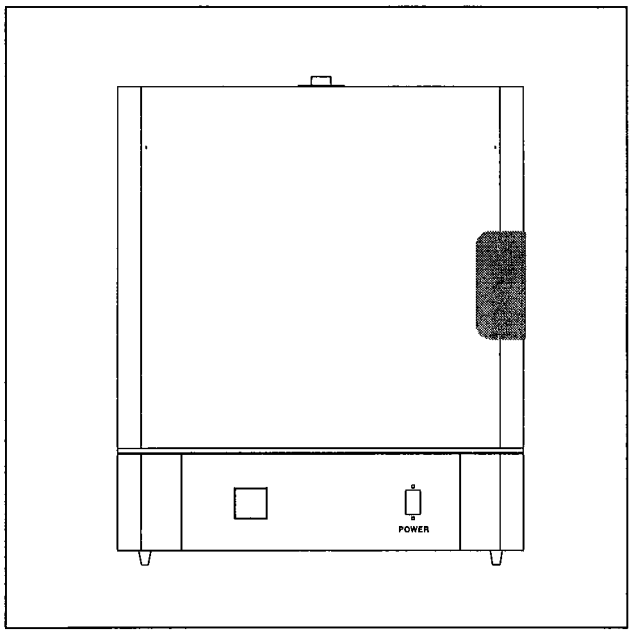
311806H01 Rev. C

Table of Contents

1 Introduction



The StableTemp® CBF Series is a family of ultra lightweight, economical, laboratory box furnaces. The low thermal mass Moldatherm® insulation/heating element provides fast duty cycles, energy conservation, and efficient programming.

1.1 Features and Benefits

- Controlled heat-up rate eliminates thermal shock to materials.
- Quick heat-up and cool-down rates.
- Three chamber sizes, S, M and L.
- Energy efficient Moldatherm insulation suitable for high interior-exterior temperature differential. The unit is rated for a maximum operating temperature of 1100°C.
- Resists attack from most corrosive agents and can be used in atmospheres other than air.
- Side-hinge door for convenient operation.
- Air vent, standard.
- Atmosphere inlet port standard.
- Digital instrumentation for precise temperature setpoint and display. Microprocessor automatically optimizes control parameters during furnace operation.
- Main power ON/OFF switch on control panel.
- Safety interlock switch automatically interrupts power to heating element when door is opened. This feature protects heating element and eliminates operator's exposure to electrical shock.
- Type K thermocouple.

2 Operating Standards

The furnaces described in this manual are classified for use as stationary equipment in a Pollution Degree 2 and Overvoltage Category II environment, according to the UL61010A-1 and IEC 664 standards.

These units are designed to operate under the following environmental conditions:

- Indoor use
- Altitude up to 2000m
- Main supply voltage fluctuations not to exceed 10% of the nominal voltage:
  - 120 VAC 50/60 Hz for "A" models
  - 208/240 VAC 50/60 Hz for "C" models.

Refer to Section 5.2 on page 3 for more details on wiring.

3 Safety Precautions

In this manual and on labels attached to this product, the words WARNING and CAUTION mean the following:

- WARNING: a potentially hazardous situation which, if not avoided, could result in serious injury or death.
- CAUTION: a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or damage to the equipment.

The following symbols are used in caution, warning and informational labels attached to the furnace:

caution, info		|	on
electrical hazard		○	off
hot surface		∿	alternating current
earth ground			
protective conductor terminal			

Before installing, using or maintaining this product, please be sure to read this manual and product warning labels carefully. Failure to follow these instructions may cause this product to malfunction, which could result in injury or damage.

WARNING! Do not modify or use equipment in a manner other than expressly intended. Modification of equipment other than that for which it is explicitly designed could cause severe injury or death. Any customer after-market retrofit violates the warranty of the equipment.

Do not reconfigure the controller. Any reconfiguration of the control instrument could cause inaccurate readings, faulty instrument values, and may cause the unit to become overheated and start on fire, causing personal injury or death, product and property damage.

Do not modify or disconnect any safety features provided. Disconnection of the unit safety features could allow the unit to become overheated and start on fire, causing personal injury or death, product and property damage.

Do not use components or materials not specifically designed for this equipment. Failure to comply with this precaution could result in damage to equipment used or the furnace and may create an overheat situation. Also, do not use anything other than OEM exact replacement equipment and parts. Not using OEM replacement parts could cause faulty instrumentation readings, inoperable equipment, or temperature overshoot. Both situations may cause personal injury or death, product, and property damage.

Before using, user shall determine the suitability and integrity of the product for the intended use and that the unit has not been altered in any way. Misapplication may compromise the safety of the end user or the life of the product.

CAUTION! This product contains refractory ceramic fiber which can result in the following:

- May be irritating to skin, eyes, and respiratory tract.
- May be harmful if inhaled.
- May contain or form cristobalite (crystalline silica) with use at high temperature (above 871°C) which can cause severe respiratory disease.
- Possible cancer hazard based on tests with laboratory animals. Animal studies to date are inconclusive. No human exposure studies with this product have been reported.

WARNING! Before maintaining this equipment, read the applicable MSDS (Material Safety Data Sheets) at the back of this manual.

WARNING! When installing, maintaining, or removing the fiberglass insulation, the following precautions will minimize airborne dust and fiber:

- Keep personnel not involved in the installation out of the area.
- Use a good vacuum to clean area and equipment. Use a dust suppressant if sweeping is necessary. Do **not** use compressed air.
- Use a disposable mask suitable for nuisance dust.
- Wear long sleeve clothing, gloves, hat, and eye protection to minimize skin and eye contact. Do not wear contact lenses.
- Thoroughly wash self after work is complete.
- Launder work clothing separate from other clothes and thoroughly clean laundering equipment after use. If clothing contains a large amount of dust and/or fiber, dispose of rather than clean.
- Promptly place used fiberglass parts and dust in plastic bags and dispose of properly.

4 Pre-Installation

4.1 Unpacking

Carefully unpack and inspect the unit and all accessories for damage. If you find any damage, keep the packing materials and immediately report the damage to the carrier. We will assist you with your claim, if requested. **Do not return goods to the manufacturer without written authorization.** When submitting a claim for shipping damage, request that the carrier inspect the shipping container and equipment.

4.2 Operating Conditions

High concentrations of sulfates, chlorides, fluorides, alkalis, and V_2O_5 can have corrosive effects on the ceramic fiber. Contact the manufacturer for additional information about the effects of specific atmospheres on furnace performance.

With prolonged use, hairline cracks can develop in the insulation materials. These minor cracks will not affect the furnace's performance. We recommend turning off the furnace completely when not in use. The heating unit is not damaged by rapid heating and cooling cycles.

4.3 Atmosphere Systems

These furnaces are not designed for use with combustible or inert atmospheres requiring an air tight chamber. If an exhaust port is used, the furnace should not be located in an enclosed area without proper ventilation.

WARNING! Do not use combustible gases in this furnace.

CAUTION! Avoid combustible products which generate toxic or hazardous vapor or fumes. Work should only be done in a properly vented environment.

5 Installation

Do not exceed the electrical and temperature ratings printed on the dataplate of the furnace and make sure that all wiring conforms to local electrical codes.

CAUTION! Improper operation of the furnace could result in dangerous conditions. To preclude hazard and minimize risk, follow all instructions and operate within design limits noted on the dataplate.

5.1 Location

Install the furnace in a level area free from vibration. To permit proper air flow, leave at least three inches of space on all sides of the unit and 12 inches above the unit.

WARNING! Do not install the furnace on a surface made of flammable material.

5.2 Wiring

For detailed wiring information, refer to the wiring diagram at the end of this manual.

WARNING! Before performing any maintenance or installation task involving electrical components, make sure that main power to the furnace has been disconnected.

5.2.1 Impedance Check

Note: *Operating this unit without checking line impedance may result in transient line disturbances.*

Refer to the table below for recommended line impedances based on cycle time settings.

Heater Cycle Time (seconds)	Maximum AC Line Impedance (Ohms)
1	0.030
2	0.036
5	0.053
10	0.077
20	0.105
30	0.128
60	0.228
70	0.236
75	0.249
81	0.308

5.2.2 120 VAC Operation

"A" models operate on 120 VAC, 50/60 Hz, single phase. Each furnace includes a 120 VAC grounded plug and cord set. The units are completely prewired and ready for operation.

Before initial start up, inspect the furnace's wiring connections:

1. Verify that power to the furnace is disconnected.
2. Remove the corner screws on the back panel of the furnace and detach the back panel.
3. Check that the thermocouple is securely mounted and undamaged.
4. Check the thermocouple wiring connections. Refer to Figure 1 on page 3. Red is always negative.

CAUTION! Failure to check thermocouple wiring connections before initial start up could result in damage to the furnace.

5. Check that all electrical connections are secure. Visually check that the door stop bracket properly contacts the power interrupt switch near the front of the furnace.

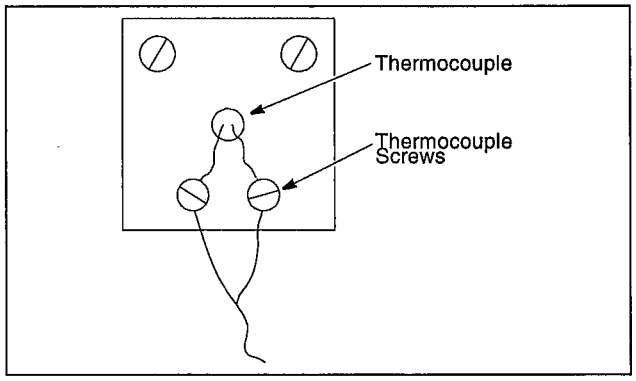


Figure 1. Thermocouple

6. Replace the back panel on the furnace and secure with the corner screws.
7. Plug the line cord into a 120 VAC, 20 amp, grounded line. The furnace draws approximately 15 amps (1800 W) .

5.2.3 208/240 VAC Operation

WARNING! Before performing any maintenance or installation task involving electrical components, make sure that power to the furnace has been disconnected.

"C" models are 240 VAC furnaces.

Follow the procedure in Section 5.2.3.1 for "S" and "M" models and the procedure in Section 5.2.3.2 for "L" models, making sure that all wiring conforms with local electrical codes.

5.2.3.1 "S" and "M" Models

"S" and "M" models with suffix "C" include a 240 VAC grounded plug and cord set. The units are completely prewired and ready for operation.

Before initial start up, inspect the furnace's wiring connections:

1. Verify that power to the furnace is disconnected.
2. Remove the corner screws on the back panel of the furnace and detach the back panel.
3. Check that the thermocouple is securely mounted and undamaged.
4. Check the thermocouple wiring connections. Refer to Figure 1 on page 3. Red is always negative.

CAUTION! Failure to check thermocouple wiring connections before initial start up could result in damage to the furnace.

5. Check that all electrical connections are secure. Visually check that the door stop bracket properly contacts the power interrupt switch near the front of the furnace.
6. Replace the back panel on the furnace and secure with the corner screws.
7. Plug the line cord into a 240 VAC, 20 amp, grounded line.

5.2.3.2 "L" Models

Large "L" model 240 VAC furnaces do not include a 240 VAC grounded plug and cord set.

Furnace installation requires two power wires and one ground wire (not provided). The required power wire size is 10 GA, 23.3 amps @ 240V.

To connect the furnace to the power source, complete the following steps:

1. Determine the length of wire needed to connect the furnace to the power source.
2. Label the power wires *Line 1* and *Line 2* and label the ground wire *Ground*.
3. Remove the two outlet box cover screws. Remove the outlet box cover.
4. Use appropriate conduit and clamps for the service wire. Use wire nuts to connect the wires to the appropriate lead wires:

Wire	*Label*
Line 1	L1
Line 2	L2
Ground	GND

5. Check that the thermocouple is securely mounted and undamaged. Check the thermocouple wiring connections. Refer to Figure 1. Red is always negative.

CAUTION! Failure to check thermocouple wiring connections before initial start up could result in damage to the furnace.

6. Check that all electrical connections are secure.
7. Place the back panel on the furnace and secure with the corner screws.

5.2.4 208 VAC Operation

Moldatherm box furnace heating elements are specifically designed for operation on 120, 208, or 240 VAC. A furnace wired for 240 VAC operation can also operate on 208 VAC. However, heatup and recovery times will be longer.

5.3 Exhaust Vent

Flow from the exhaust vent on the top of the unit can be adjusted by inserting or removing the plug provided.

For most applications, the exhaust vent should be fully plugged during operation of the furnace; a closed vent results in more efficient operation and greater temperature stability. However, there are some applications which benefit from a partially or fully open exhaust vent.

The exhaust vent should be partially or fully open for the following applications:

- To provide slow cool down of work load. Some work loads may be damaged by heat shock when the furnace door is opened. The vent can be opened to allow work load to cool gradually.
- To remove unwanted vapors and gases from the furnace chamber. If you need to ventilate vapors and gases outside of the room, be sure to read Section 5.4.

Figure 2 shows how you can use the plug to adjust flow from the exhaust vent.

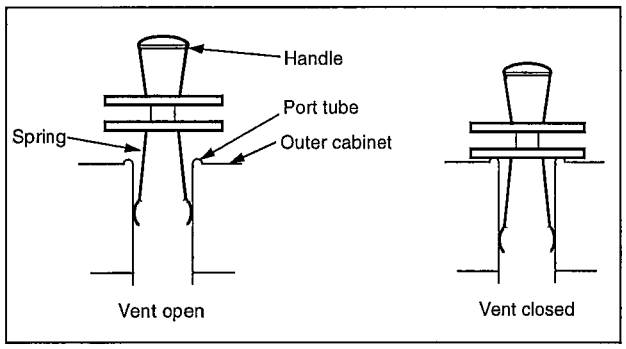


Figure 2. Exhaust Vents

5.4 Exhaust Port Connections

The one inch diameter exhaust port through the top wall of the furnace allows for the removal of unwanted vapors and gases produced during high-temperature operation.

When you need to ventilate vapors and gases outside of the room, be sure to make a proper connection to the exhaust port that allows some room air to flow into the hood or pipe. This is necessary to prevent "chimney effect" which sucks heat out of the chamber and results in slow run-up time or poor temperature uniformity.

Two methods of making the exhaust port connection are shown in Figure 3 below. With a hood suspended above the furnace, be sure that there is at least three inches between the hood and the exhaust port. If you use a metal tube or pipe leave at least one inch clearance.

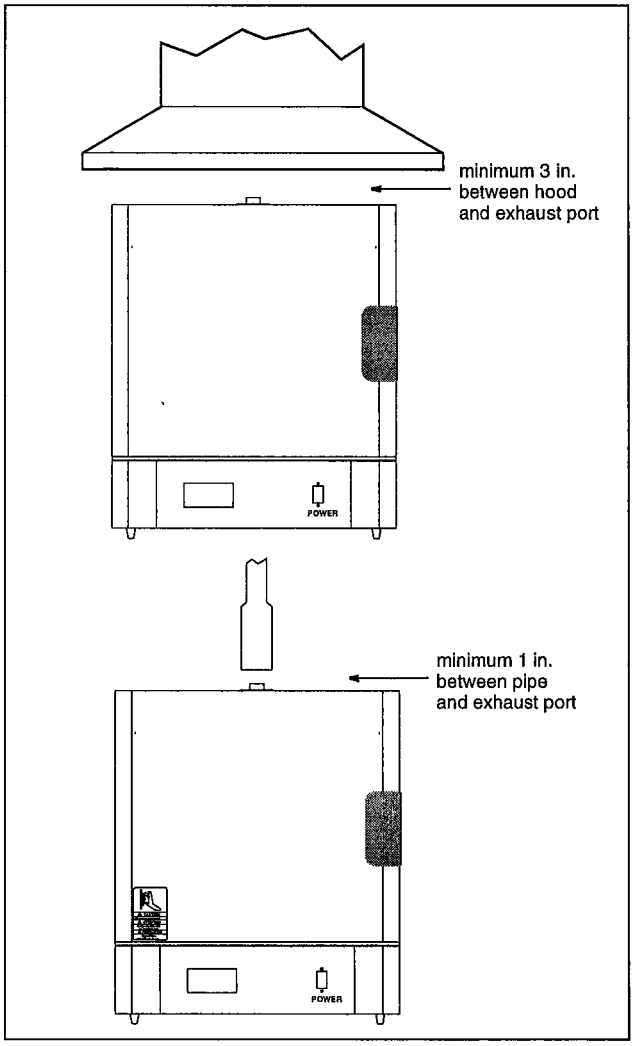


Figure 3. Preventing Chimney Effect

6 Start Up

CAUTION! Observe the following precautions when operating the furnace:

- Never stand in front of an open furnace.
- Wear protective eyeware.
- Wear protective gloves.
- Use tongs to insert and remove furnace load.
- Do not allow the load to touch the furnace walls.
- Always use a hearth plate on the furnace bottom.

WARNING! Before operating this equipment, read the applicable MSDS (Material Safety Data Sheets) at the back of this manual.

WARNING! When installing, maintaining, or removing the refractory insulation, the following precautions will minimize airborne dust and ceramic fiber:

- Keep personnel not involved in the installation out of the area.
- Use a good vacuum to clean area and equipment. Do **not** use compressed air.
- Use NIOSH high efficiency respirator (3M #8710 or equivalent).
- Wear long sleeve clothing, gloves, hat, and eye protection to minimize skin and eye contact. Do not wear contact lenses.
- Thoroughly wash self after work is complete.
- Launder work clothing separate from other clothes and thoroughly clean laundering equipment after use. If clothing contains a large amount of dust and/or ceramic fiber, dispose of rather than clean.
- Promptly place used ceramic fiber parts and dust in plastic bags and dispose of properly.

6.1 Door Seal Check

It is very important to check the door seal before using this furnace. Door seal integrity is essential to maintain temperature uniformity and prevent fumes being released into the area surrounding the furnace.

To check the door seal:

1. With the furnace power off and chamber cold, open the door.
2. Insert a strip of paper (a couple of inches wide) between the door insulation and the chamber opening. Do not position the paper in the corner of the chamber. Close the door.
3. Slowly pull the paper strip from the outside. You should feel some resistance. If the paper does not pull out, this area of the door seal may be causing a gap in another area of the door seal.
4. Repeat this test at 2-inch intervals around the door. If the door does not seal properly, a door adjustment must be done .

6.2 Furnace Start Up

The furnace has a power interrupt switch. Opening the furnace door shuts off power to the heating unit. The door must be completely closed before the furnace will operate.

To start up the furnace, complete the following steps:

1. Turn furnace ON.
2. Adjust the setpoint to 200°C, following the controller instruction manual (provided separately).
3. Run the furnace for two hours at 200°C.
4. Check for heat loss through the door. In the event of heat loss, recheck the door seal (refer to Section 5.1).
5. Adjust the setpoint to 550°C.
6. Run the furnace for two hours at 550°C.
7. Adjust the setpoint to 1,000°C.
8. Run the furnace for two hours at 1,000°C.
9. Adjust setpoint to room temperature.

7 Control Operation

7.1 Main Temperature Control

The programmable process temperature controller is located on the left side of the control panel.

516 models have single setpoint temperature controls; 517 models have single setpoint with dual display; 518 models have 16-segment programmable controls.

All controllers have a maximum process temperature setpoint of 1100°C.

For instructions on control operation, refer to the separate manual provided.

7.2 Overtemperature Control ("L" Models Only)

In addition to the main temperature controller, "L" models also have an overtemperature controller which you can use to set an alarm setpoint and monitor alarm conditions.

The overtemperature control is located in the middle of the control panel, to the right of the main controller.

The display shows the current alarm setpoint. When the cabinet temperature exceeds the alarm setpoint, a light flashes on the controller and power to the heating elements is shut off.

The factory-set value of the alarm setpoint is 1125°C. You may not set this value higher, but you may change it to a value lower than 1125°C.

If the factory-set alarm setpoint of 1125°C is appropriate to your application, then you do not need to do anything to adjust or activate the alarm. The overtemperature alarm is automatically activated when the furnace is powered up.

To decrease the alarm setpoint, press the star and down-arrow buttons together; to increase it, press the star and up-arrow buttons together.

8 Maintenance

CAUTION! Maintenance should only be performed by trained personnel.

WARNING! Disconnect furnace from main power before attempting any maintenance to furnace or its controls.

WARNING! Before maintaining this equipment, read the applicable MSDS (Material Safety Data Sheets) at the back of this manual.

WARNING! When installing, maintaining, or removing the refractory insulation, the following precautions will minimize airborne dust and ceramic fiber:

- Keep personnel not involved in maintenance out of the area.
- Use a good vacuum to clean area and equipment. Do **not** use compressed air.
- Use NIOSH high efficiently respirator (3M #8710 or equivalent).
- Wear long sleeve clothing, gloves, hat, and eye protection to minimize skin and eye contact. Do not wear contact lenses.
- Thoroughly wash self after work is complete.
- Launder work clothing separate from other clothes and thoroughly clean laundering equipment after use. If clothing contains a large amount of dust and/or ceramic fiber, dispose of rather than clean.
- Promptly place used ceramic fiber parts and dust in plastic bags and dispose of properly.

8.1 Cleaning

Clean the furnace chamber with a vacuum or wet cloth.

WARNING! Never use compressed air to clean the furnace. This may create a health hazard because of the ceramic fiber insulation.

WARNING! Do not attempt to clean the furnace when surfaces are hot.

Before using any cleaning or decontamination method not recommended in this manual, contact Service to ensure that the proposed method will not damage the equipment or create a health hazard.

8.2 Thermocouple Replacement

WARNING! Before performing any maintenance or installation task involving electrical components, make sure that main power to the furnace has been disconnected.

Note: *For optimal performance, the thermocouple should be replaced once a year. In some situations a more frequent replacement schedule is warranted.*

Refer to Figure 4 as you perform the following procedure:

1. Remove any atmosphere piping connected to the atmosphere pipe (item #2 in Figure 4).
2. Remove the two screws from the atmosphere pipe. Pull the atmosphere pipe straight out of the furnace.

CAUTION! Failure to pull the atmosphere pipe straight out of the furnace will result in damage to the atmosphere pipe or the heating unit.

3. Remove the screws from rear panel corners. Remove the rear panel (item #1 in Figure 4).
4. Note polarity and wire location. Loosen the terminal screws and remove thermocouple lead wires.
5. Remove thermocouple mounting screws.
6. Slide out head and old thermocouple (item #3 in Figure 4).
7. Replace the thermocouple and connect new wires. Be careful not to bend the thermocouple wire. Red is always negative. (If the extension leads are black and white, white is negative). Refer to Figure 1 on page 3 for additional wiring information.
8. Replace the furnace rear panel.
9. Replace the atmosphere pipe.

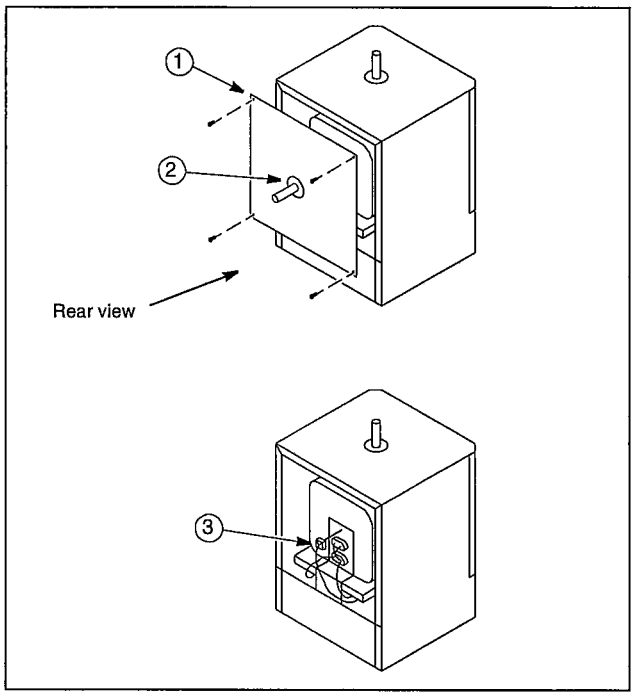


Figure 4. Thermocouple Replacement

8.3 Solid-State Relay Replacement

WARNING! Before performing any maintenance or installation task involving electrical components, make sure that power to the furnace has been disconnected.

Refer to the Troubleshooting section for relay testing. If the solid-state relay is inoperable, complete the following steps to replace the relay (refer to Figure 5):

1. Remove the screws located on the left and right sides of the control panel (item #1 in Figure 5).
2. Slide the panel assembly away from the unit to expose components.
3. Locate the solid-state relay on the component tray (item #2 in Figure 5).
4. Note the terminal connections of the relay wires and label them for reattachment. Remove the wires from the terminals of the relay.
5. Remove the mounting screws from the relay.
6. Replace the relay and reconnect the wires.
7. Reassemble the unit.

8.4 Power Relay Replacement

WARNING! Before performing any maintenance or installation task involving electrical components, make sure that main power to the furnace has been disconnected.

Refer to the Troubleshooting section for power relay testing. If the power relay is inoperable, complete the following steps to replace the relay (refer to Figure 5):

1. Remove the screws located on the left and right sides of the control panel (item #1 in Figure 5).
2. Slide the panel assembly away from the unit to expose components.
3. Locate the power relay on the component tray (item #3 in Figure 5).
4. Note the terminal connections of the relay wires and label them for reattachment. Remove the wires from the terminals of the relay.
5. Remove the mounting screws from the relay.
6. Replace the relay and reconnect the wires.
7. Reassemble the unit.

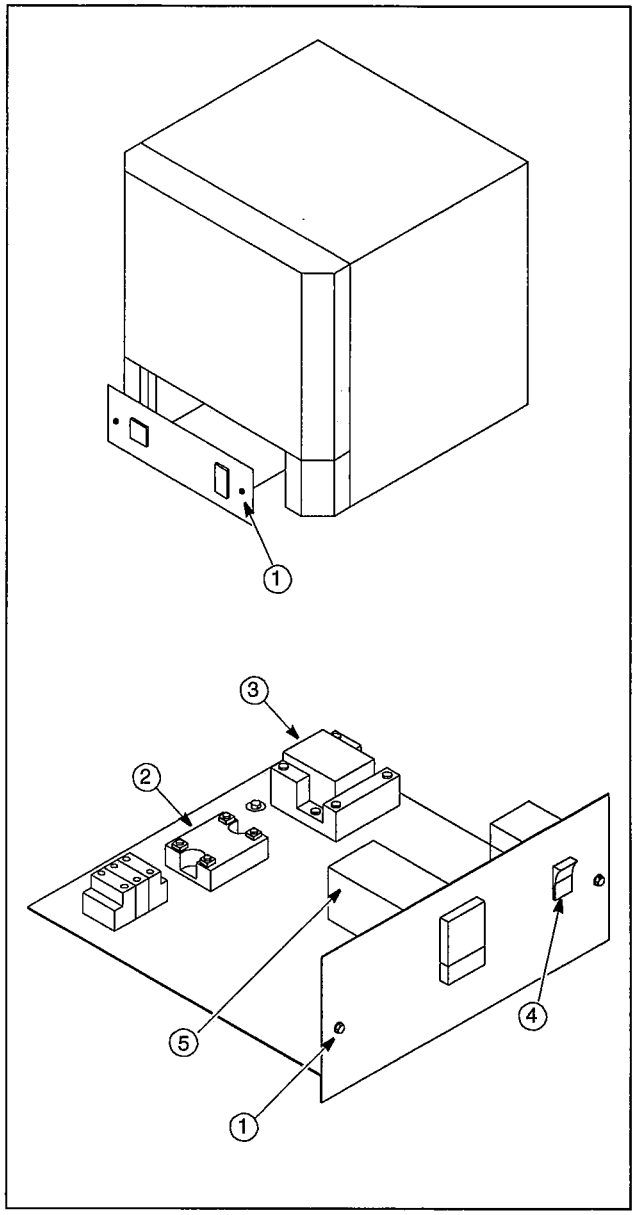


Figure 5. Solid State Relay Replacement

8.5 Temperature Controller Replacement

WARNING! Before performing any maintenance or installation task involving electrical components, make sure that power to the furnace has been disconnected.

To replace the entire controller, complete the following steps (refer to Figure 5):

1. Disconnect the main power and switch the circuit breaker (#4 in Figure 5) to the OFF position.
2. Remove the two sheet metal screws located on each side of the furnace near the lower front (#1 in Figure 5). Pull the control panel forward to access the controller (#5 in Figure 5).
3. Note the terminal connections of the wires and label them for reattachment. Remove power input and output wires from the back of the controller. Observe polarity for the thermocouple lead wire. Red is always negative. Refer to Figure 1 on page 3 for additional wiring information.
4. Pull the controller out through the front of the control panel.
5. Install the replacement instrument by reversing the above procedure.

8.6 Door Seal Adjustment

The door catch may be causing the door seal to gap on the right side and be okay on the top and bottom. The catch plate can be adjusted using the hex nuts behind the door pull. The door pull can be removed from the right side of the door by prying the edge closest to the cabinet.

To make the door seal adjustment:

1. Door assemblies have hex nuts attaching the insulation frame to the outer door frame. Loosen the appropriate nuts and move the door insulation frame to improve the door seal.
2. Recheck the door seal, following the instructions in Section 6.1 on page 6.
3. If a gap is detected only in the center top edge of the door seal, loosen the four nuts and adjust as necessary.
4. After each adjustment recheck the door seal.

The door seal has been adjusted properly if there is no heat loss when operating the furnace up to 500°C.

8.7 Heating Unit Replacement

WARNING! Before performing any maintenance or installation task involving electrical components, make sure that power to the furnace has been disconnected.

CAUTION! This product contains ceramic fiber or other refractories which can result in the following:

- May be irritating to skin, eyes, and respiratory tract.
- May be harmful if inhaled.
- May contain or form cristobalite (crystalline silica) with use at high temperature (above 871°C) which can cause severe respiratory disease.
- Possible cancer hazard based on tests with laboratory animals. Animal studies to date are inconclusive. No human exposure studies with this product have been reported.

To replace the heating unit, complete the following steps (refer to Figure 6):

1. Remove any atmosphere piping connected to the atmosphere pipe (item #2 in Figure 6).
2. Remove the two screws from the atmosphere pipe. Pull the atmosphere pipe straight out of the furnace.

CAUTION! Failure to pull the atmosphere pipe straight out of the furnace will result in damage to the atmosphere pipe or the heating unit.

3. Remove the screws from corners of the rear panel (#1 in Figure 6).
4. Remove the rear panel to expose the heating unit assembly.
5. Remove the two screws from the exhaust vent. Pull the exhaust vent straight up and out of the furnace.
6. Remove the six corner screws from the shell (#3 in Figure 6).
7. Lift the shell away from the base of the cabinet to expose the entire heating unit.
8. Note the terminal connections of the element wires and label them for reattachment. Loosen the terminal nuts and remove the element wires (#4 in Figure 6).
9. Remove the thermocouple head screws and slide the thermocouple out (#5 in Figure 6).
10. Unhook the spring-bands from the base of the chassis.
11. Replace the heating unit and reassemble the furnace.

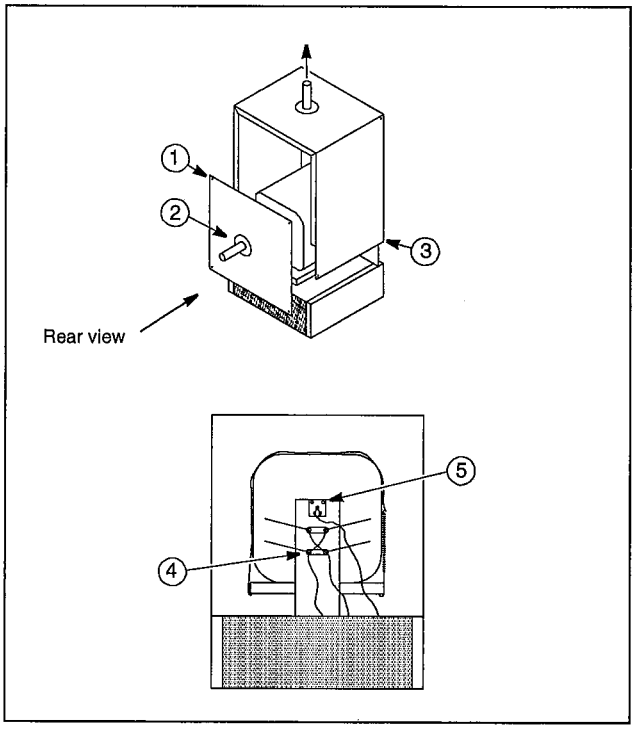


Figure 6. Heating Unit Replacement

8.8 Circuit Breaker Replacement

The control circuitry is protected by a circuit breaker located at the front of the furnace. When the circuit breaker opens, check the circuit for faults and press the circuit breaker switch to reset. Replace any circuit breaker which does not reset properly after the circuit has been checked.

9 Troubleshooting

⚠ **WARNING!** Troubleshooting procedures involve working with high voltages which can cause injury or death. Troubleshooting should only be performed by trained personnel.

Table 1. Furnace Troubleshooting

Problem	Solution
Furnace temperature runs away.	Check solid-state relay: 1. Remove the temperature controller from the sleeve. 2. Connect power to the furnace. If the heating unit heats, replace the solid-state relay.
Furnace does not heat.	Front panel red indicator light is on: 1. If the controller output light is off, check that the setpoint temperature is higher than the furnace display temperature. 2. If the controller output light is on, disconnect power from the furnace and check the heating elements for continuity.
	Front panel red indicator light is off: 1. Check that the power switch is on. 2. Check that the indicator lights on the controller display are on. 3. Check that the furnace door is fully closed. 4. Check that the door interrupt switch at the middle front of the furnace is engaged when the furnace door is fully closed. 5. Check the electrical wires for visible damage. Replace the electrical wires if necessary.

Moldatherm® Insulation Material Safety Data Sheet

Revision Date November 6, 1992 Replaces MSDS dated: August 14, 1987

Completed by: Lindberg/Blue M Unit Environmental, Safety, and Health Department

I. PRODUCT IDENTIFICATION			
Trade Name:	Moldatherm II® Insulation (Also known as Moldatherm® Insulation) Synonyms: Refractory Ceramic Fibers (RCFs); Ceramic Fiber; Man-Made Vitreous Fibers (MMVF); Mullite; High Alumina Ceramic Fiber		
Chemical Family:	Vitreous Aluminosilicate Fibers		
Molecular Formula:	$Al_2O_3 \cdot SiO_2$		
II. PRODUCT COMPOSITION			
Component	**CAS No.**	**Percent (%)**	**Exposure Limits (8 hr. TWA)**
Aluminosilicate	NA – Mixture	79 to 99	1.0 fibers/cc**
Silica, amorphous	7631-86-9	1 to 21	10 mg/m^3 ACGIH/TLV 6 mg/m^3 OSHA/PEL

Remaining components not determined hazardous and/or other components present at less than 1.0% (0.1% for carcinogens).

** NOTE: No OSHA or ACGIH exposure limits have been established for this material. The user is advised to follow the Lindberg/Blue M Recommended Exposure Limit (REL). (See Section VII. Personal Protective Equipment).

Moldatherm® insulation will partially convert to cristobalite (CAS No. 14464-46-1), a form of crystalline silica, at operating temperatures at or above 1800°F. The rate and percentage of conversion to cristobalite is time and temperature dependent. (See Section X. Special Precautions/Supplemental Information.) Cristobalite has an OSHA permissible exposure limit (PEL) and ACGIH threshold limit value (TLV) of 0.05 mg/m^3 (respirable dust).

NA = Not Applicable

III. PHYSICAL DATA					
Boiling Point:	NA	**Vapor Pressure:**	NA	**Vapor Density:**	NA
Evaporation Rate:	NA	**% Volatile:**	NA	**Water Solubility (%):**	Nil
Melting Point:	Greater than 3000°F	**Odor/Physical Description:**		White, odorless solid	

IV. FIRE AND EXPLOSION DATA			
Flash Point:	NA	**Flammable Limits (LEL & UEL):**	NA
Unusual Fire or Explosion Hazards:	None	**Extinguishing Media:**	NA
Fire Fighting Procedures:	Use extinguishing media suitable for surrounding fire.		

V. HEALTH HAZARDS	
A. Health:	WARNING! MAY BE IRRITATING TO SKIN, EYES, AND RESPIRATORY TRACT. MAY BE HARMFUL IF INHALED. POSSIBLE CANCER HAZARD BY INHALATION. Contains refractory ceramic fibers which MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure. (See Section X. for information concerning additional hazards after high temperature operation.)
B. Ingestion:	Ingestion is unlikely. If ingested in sufficient quantity, may cause gastrointestinal disturbances. Symptoms may include irritation, nausea, vomiting, abdominal pain and diarrhea.
C. Skin:	Slightly to moderate irritating. May cause irritation, inflammation, and rash.
D. Eye:	Slightly to moderate irritating. Abrasive action may cause damage to the outer surface of the eye.
E. Inhalation:	May irritate respiratory tract. Pre-existing medical conditions, especially chronic bronchial or lung disease may be aggravated by exposure.
F. Toxicity:	Existing toxicology and epidemiology data are preliminary and the results presented below have not been validated by scientific review.
G. Epidemiology:	There are no known published reports of negative health affects of workers exposed to refractory ceramic fibers (RCFs). Studies of RCF production workers continues. Preliminary evidence, reportedly obtained from employees in RCF manufacturing facilities, indicates the following: 1. There is no evidence on x-rays of any fibrotic lung disease of RCF manufacturing employees. 2. There is no evidence of any lung disease among those employees exposed to RCF that never smoked. 3. A statistical trend of slightly decreased pulmonary function was observed in the exposed population of workers based on the duration of RCF exposure. The statistic showing decreased pulmonary function was within the normal range and/or was insignificant.

NA = Not Applicable

	Pleural plaques (thickening along the chest wall) have been observed in a small number of employees who had a long duration of employment. There are several occupational and non-occupational causes for pleural plaque. Plaques are not "pre-cancer" nor are they associated with any measurable effect on lung function.
H. Toxicology:	Several health effect studies of inhalation exposure of rats and hamsters are now reaching completion. In a lifetime nose-only inhalation study, rats exposed to a very high dose of 30 mg/m^3 (200 fibers/cc) developed progressive lung damage (interstitial fibrosis) and cancers of the lung and of the pleura (lining of the chest wall and lung). In contrast, hamsters similarly exposed developed interstitial fibrosis and pleural cancer, but no lung cancer. Cancer of the pleura is called mesothelioma. A multiple dose study (3, 9, 16 mg/m^3 or 25, 75, 150 fibers/cc, respectively) is currently ongoing in rats. After 24 months of exposure, only reversible cellular changes have been seen in the low dose group. At 9 mg/m^3 (75 fibers/cc), areas of lung fibrosis are barely discernible and at 16 mg/m^3 (150 fibers/cc) both lung and pleural fibrosis are present. At this time, no lung or pleural cancer has been seen in the multiple dose study. This information will be updated once the study is completed. In 1987, the International Agency for Research on Cancer (IARC) reviewed the carcinogenicity data on man-made vitreous fibers (including ceramic fiber, glasswool, rockwool, and slagwool). IARC classified ceramic fiber, fibrous glasswool and mineral wool (rockwool and slagwool) as possible human carcinogens (Group 2B).
VI. EMERGENCY AND FIRST AID PROCEDURES	
Ingestion:	Drink extra water. Allow for natural gastrointestinal elimination. Get medical attention if gastrointestinal symptoms develop (see Section V.).
Skin Contact:	Remove contaminated clothing. Wash affected skin thoroughly with soap and water. Do not rub or scratch exposed skin. A skin cream or lotion used after washing may be helpful. Seek medical attention if irritation persists.
Eye Contact:	Immediately rinse eyes with water. Remove any contact lenses, and continue flushing eyes with running water for at least 15 minutes. Do not rub eyes. Hold eyelids apart to ensure rinsing of the entire surface of eyes and lids with water. Get immediate medical attention.
Inhalation:	Remove exposed person to fresh air. Seek medical attention if shortness of breath, cough, wheezing, or chest pain develop. If breathing is labored, administer oxygen until medical assistance can be rendered.
VII. PERSONAL PROTECTIVE EQUIPMENT	
Eyes:	Wear safety glasses or chemical goggles. Contact lenses should not be worn unless chemical goggles are also used and care is taken to not touch the eyes with contaminated body parts or materials.
Skin:	Wear gloves, hats and full body covering to prevent skin irritation as necessary (see Section X.).

NA = Not Applicable

Respiratory Protection:	Use of properly designed and operating engineering controls is recommended and preferred over respiratory protection for controlling airborne dust and fiber concentrations. If exposures exceed our Recommended Exposure Limit (REL) of 1.0 fibers/cc of air (8 hour TWA) respiratory protection as outlined below must be used. Also, use respiratory protection if throat irritation is experienced. When airborne concentrations are unknown or exceed 0.5 f/cc, use of a half face respirator described below is recommended. Respiratory protection is necessary if the material has been exposed to temperatures at or above 1800°F. (See Section X.). Use only NIOSH/MSHA approved respirators.

Concentration (8 hour TWA)	**Minimum Acceptable Respirator Type**
0 to 0.5 f/cc	Optional disposable dust respirator
0.5 f/cc to 5 f/cc or up to 10 times the OSHA PEL for cristobalite	Half face, air-purifying respirator equipped with high-efficiency particulate air (HEPA) filter cartridges
5 to 25 f/cc or up to 50 times the OSHA PEL for cristobalite ($2.5\ mg/m^3$)	Full face, air-purifying respirator with high-efficiency particulate air (HEPA) filter cartridges or powered air-purifying respirator (PAPR) equipped with HEPA filter cartridges
Greater than 25 f/cc or 50 times the OSHA PEL for cristobalite ($2.5\ mg/m^3$)	Full face, positive pressure supplied air respirator
As minimum protection, use half-mask air-purifying respirators equipped with HEPA filter cartridges if airborne fiber levels or cristobalite concentrations are not known.	

PLEASE NOTE:

Employees must be given instruction, fit testing, medical evaluation, and training per 29 CFR 1910.134 and your company's written respirator program if respiratory protection is used. Appropriate respirator selection must be a part of the respirator program. The above respirator recommendations are general guidelines only and may not be appropriate for certain applications. Please consult with your safety or industrial hygiene staff or consultants.

VIII. REACTIVITY DATA

Stability/Incompatibility:	Stable under normal conditions of use. Soluble in hydrofluoric acid, phosphoric acid, and concentrated alkali.
Hazardous Reactions/Decomposition Products:	NONE

IX. ENVIRONMENTAL AND REGULATORY INFORMATION

Spill or Leak Procedure:	Use vacuums equipped with HEPA filters to clean up spilled material. Wet sweeping is also acceptable.

NA = Not Applicable

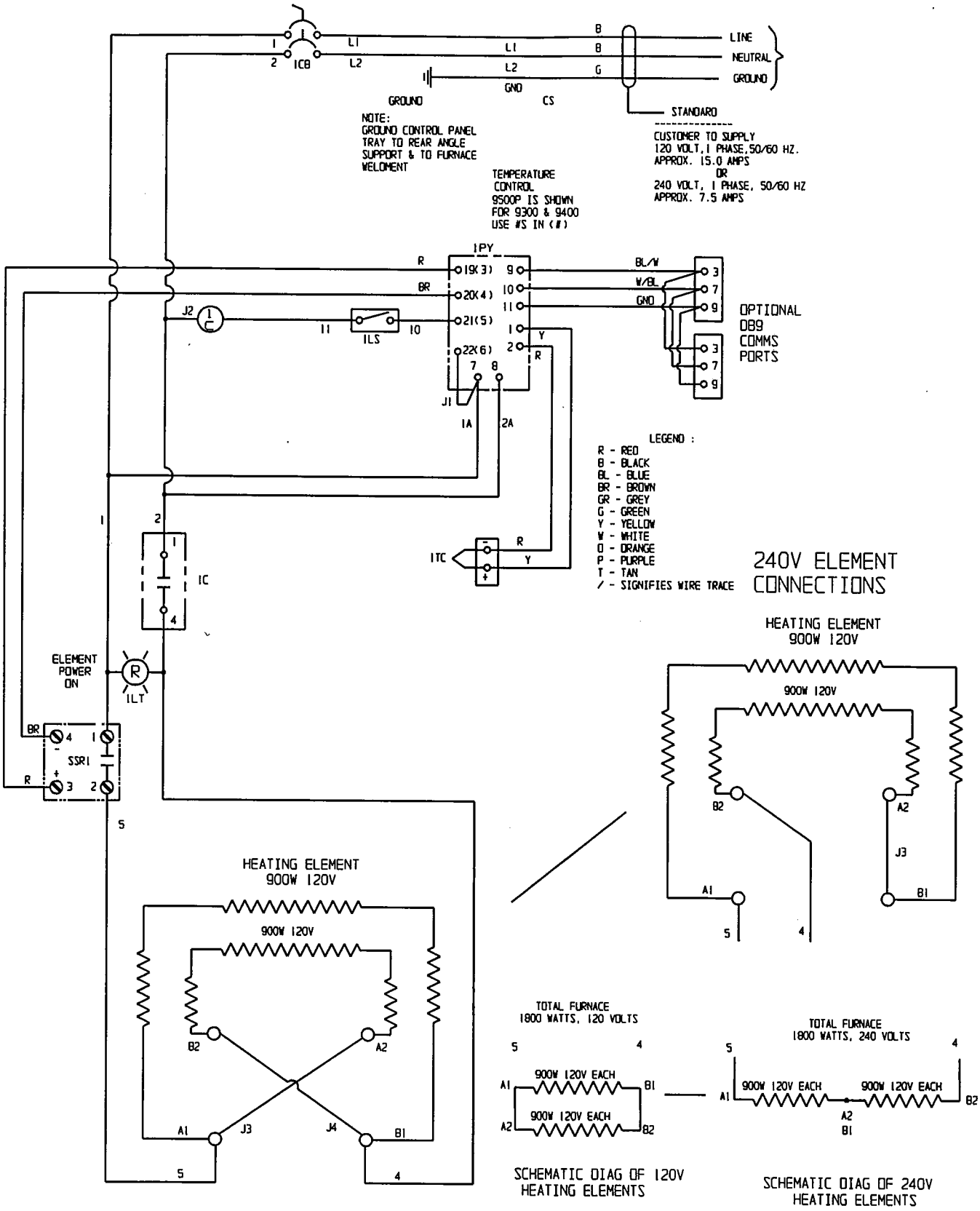
Waste Disposal:	This waste is not specifically listed as a hazardous waste under Federal regulations. However, it could be characteristically hazardous if it is considered toxic, corrosive, ignitable, or reactive according to Federal definitions (40 CFR 261). Additionally, it could be designated as hazardous or a special waste according to state regulations. This substance could also become a hazardous waste if it is mixed with or otherwise comes in contact with hazardous waste. Chemical additions, processing, or otherwise altering this material may make the waste management information presented in this MSDS incomplete, inaccurate, or otherwise inappropriate. The transportation, storage, treatment, and disposal of this waste material must be conducted in compliance with all applicable Federal, state, and local environmental regulations.
SARA Title III Information:	This material is designated a "delayed hazard" per the Superfund Amendments and Reauthorization Act (SARA) Section 311/312 (40 CFR 370). This product does not contain any toxic chemicals subject to the reporting requirements of SARA Section 313 (40 CFR 372).
	This product contains ceramic fibers which are on the State of California "Proposition 65" list (Safe Drinking Water and Toxic Enforcement Act of 1986).
	The Canadian Workplace Hazardous Materials Information System (WHMIS) category of "Other Toxic Effects" applies to this product.
	This product is not a DOT listed hazardous material. Use product name for bill of lading description.
	Some states have "special waste" regulations or other regulations which may apply to this product. Consult with your state environmental regulatory authorities.
	X. SPECIAL PRECAUTIONS/SUPPLEMENTAL INFORMATION
Handling/Storage:	Moldatherm® insulation should be handled with caution. Follow the personal protective equipment recommendations detailed in Section VII. Special precaution should be taken to avoid unnecessary cutting and tearing of the material to minimize generation of airborne dust.
Clothing:	Full body clothing is recommended to reduce the possibility of skin irritation. If possible, do not take unwashed work clothes home. Work clothes should be washed separately from other clothing. Rinse the washing machine thoroughly after laundering the work clothes. Inform your launderer of this cleaning procedure.

NA = Not Applicable

Cristobalite:	Product which has been in service at elevated temperatures (at or above 1800°F) over time may undergo partial conversion to cristobalite, a form of crystalline silica. This reaction occurs at the furnace lining hot face. As cristobalite is formed, Moldatherm® insulation becomes more friable; special caution must be taken to minimize generation of airborne dust. The amount of cristobalite formed will vary based on the operating temperature and length of service. (The IARC classification for crystalline silica is a group 2A carcinogen (probable human carcinogen). Cristobalite (crystalline silica) is also listed by NTP as a carcinogen). WARNING! DUST CAN CAUSE SEVERE RESPIRATORY DISEASE. DUST MAY BE IRRITATING TO SKIN, EYES, AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD BY INHALATION. Cristobalite (crystalline silica) MAY CAUSE CANCER. The OSHA permissible exposure limit (PEL) and the ACGIH threshold limit value (TLV) for cristobalite is 0.05 mg/m^3 (respirable dust). Use NIOSH/MSHA approved respirators when airborne exposure limits may be exceeded. (See Section VII. table for respirator selection.)
Removal or Tearout of Moldatherm® Insulation:	Insulation surfaces should be lightly sprayed with water before removal to suppress airborne dust. Spray additional water as water evaporates during removal. A surfactant may aid the wetting process. After removal of the Moldatherm® insulation is complete, dust suppressing cleaning methods, such as wet sweeping or vacuuming should be used to clean the work area. If dry vacuuming is used, the vacuum must be equipped with a HEPA filter. Air blowing or dry sweeping should not be used. Dust suppressing components can be used to clean up light dust. Do not reuse product packaging because of possible product residue.

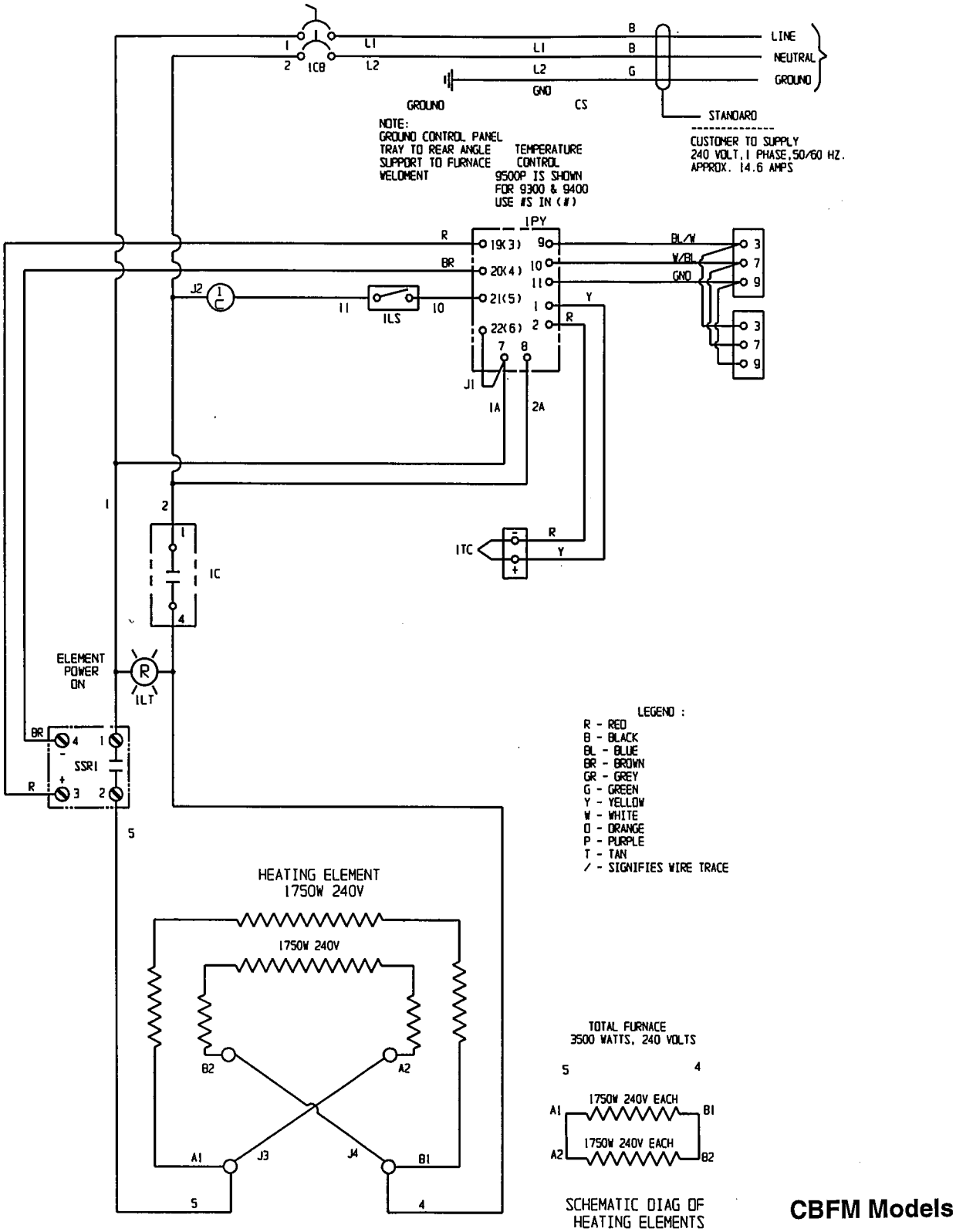
NOTICE: The information presented here is based on data considered to be accurate as of the date of preparation of this Material Safety Data Sheet. However, no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. No responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices, or from any hazards inherent in the nature of the product.

NA = Not Applicable



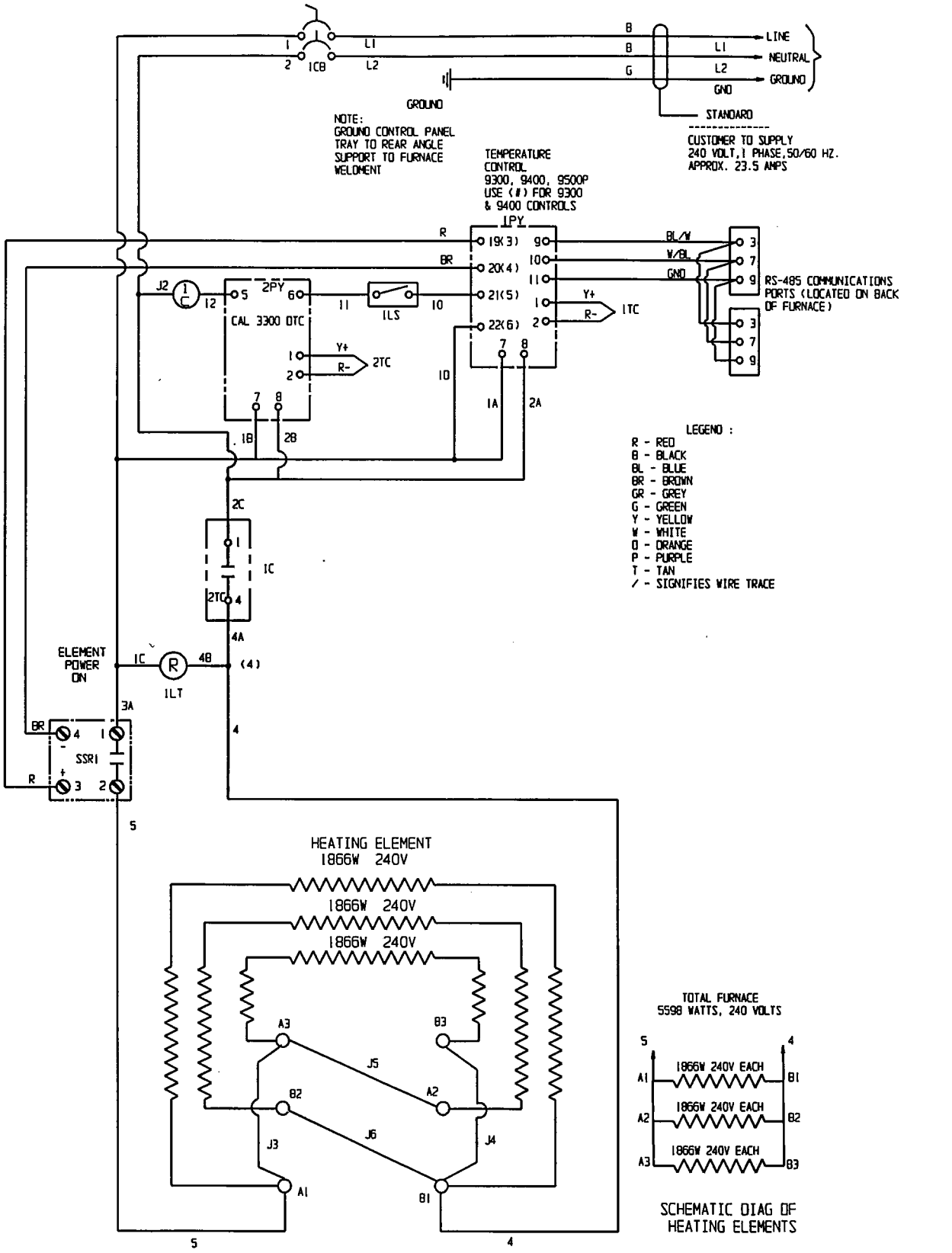
CBFS Models

CBFS
WIRING DIAGRAM
A 310594101
REV.E



CBFM Models

WIRING DIAGRAM
A 310594-02
REV. G



CBFL Models

TERM. STRIP # OUTSIDE IS STRIP #, INSIDE IS LUG #

RELAY COIL # OUTSIDE IS TERM #, INSIDE IS RELAY #

RELAY CONTACTS - NO (LARGER # IS RELAY #)

RELAY CONTACTS - NC (SMALLER # IS TERM. #)

TIME DELAY BEFORE MAKE (ADJUSTABLE)

WIRES CONNECTED

WIRES NOT CONNECTED

NC PRESS. SW. OPENS ON RISE

NO PRESS. SW. CLOSES ON DROP

NO TEMP. SW. CLOSES ON RISE

TIMER MOTOR

HEATER

FAN MOTOR

WIRING DIAGRAM
A 310594 103
REV F

31146510I

9300

LEVEL 1

DESCRIPTION	Config Code	Setting
Autotune or Park	tune	off
SP1 Proportional Band	band	10
Integral Time	Int.t	5
Derivative Time	der.t	25
SP1 Derivative Approach	dAC	1.5
Cycle Time	cyc.t	0.1
Offset (Manual Reset)	ofSt	0
Setpoint Lock	SP.LK	off
Setpoint Ramp Rate	Sprr	0
Ramp on off or hold	Sprn	off
Soak	Soak	--
Adj. SP2 ± Sensor Full Scale (NOTE 1)	Set.2	1125=AI
SP2 Hysterisis	bnd.2	2.0
SP2 Cycle	cyc.2	on. off

LEVEL 2

DESCRIPTION	Config Code	Setting
Read SP1 Output % (NOTE 2)	SP1.P	100
SP1 Manual Output %	hand	oFF
SP1 Output % Limit	PL.1	100
SP2 Output % Limit	PL.2	100
Main SP2 Mode	SP2.A	FS.hI
Second SP2 Mode	SP2.b	nL.In
Display Resolution	diSP	1
Set Scale Max	hI.Sc	1100
Set Scale Min	Lo.Sc	0
Select Input Sensor	InPt	tc K
Select Display Units	UnIt	c

FIRMWARE REV. ______

PC SOFTWARE REV. ______

LEVEL 3

DESCRIPTION	Config Code	Setting
SP1 Output Device (NOTE 3)	SP1.D	SSd
SP2 Output Device (NOTE 3)	SP2.d	rLy
Sensor Burn-Out	bUrn	UP.Sc
Reverse Outputs	rEUd	Ir.2d
Reverse Output LED's	rEU.L	In2n
Span Adjustment	SPAn	0.0
Zero Adjustment	ZEro	0.0
Set Monitor	chEH	oFF
Read Monitor	rEAd	uAr
Read Tune Data	tEch	ctA
Software Version	uEr	941
Reset	rSEt	nonE

LEVEL 4

DESCRIPTION	Config Code	Setting
Derivitive Sensitivity	dEr.5	0.5
Display Averaging	dI.SS	dIr
Disable -AL- alarm display; on	no.AL	on
Disable program auto-exit	ProG	AUto
Security Lock	LocK	nonE
Change Prog Entry Point	Set.L	oFF

LEVEL C FOR UNITS WITH COMMUNICATION

LEVEL C

DESCRIPTION	Config Code	Setting
Instrument Address	Addr	1
Baud Rate	bAUd	9600
Data Format	dAtA	18n1
Tx Rx Activity	dbUc	oFF

NOTE 1: WILL NOT SET 1ST TIME THROUGH

NOTE 2: APPEARS TO SET AUTOMATICALLY WHEN SETPOINT IS SET?

NOTE 3: IF SP1.D & SP2.d IS SELECTED BACKWARDS, IT IS POSSIBLE THE CONTROL RELAY WILL CHATTER & TURN OFF @ SETPOINT OR ABOVE

REV	ECR NO.	[ZONE] DESCRIPTION	DATE
B	46163	ADDED NOTES LEVEL 1 CYCLE TIME WAS 1.5, OFFSET WAS 1.0 SP2 ADDED =A1	DW 8/31/04
A	43139	SETPOINT LOCK VAR WAS SP.LK VALUE WAS 0 SP1.P PARAMETER WAS read only.	JJS 11/19/02

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES. TOLERANCES: ANGLES ± 1° 2 PLACE DECIMALS ± .060 3 PLACE DECIMALS ± .030

DO NOT SCALE THIS DRAWING

◇ DENOTES CRITICAL DIMENSIONS

MATERIAL: N/A

DRAWN JJS 8/22/02

CHECKED

APPROVED

RELEASED 41568

Kendro — KENDRO LABORATORY PRODUCTS, INC 275 AIKEN ROAD ASHEVILLE, NC 28804

TITLE CONTROLLER CONFIG CAL 9300

SIZE B DWG. NO. 31146510I

SCALE NONE DIST. QC SHEET 1 of 1

PRO-E Format rev. 01/15/03

311465102

9400

LEVEL 1		
DESCRIPTION	Config Code	Setting
Autotune or Park	tune	off
SP1 Proportional Band	band	10
Integral Time	Int.t	5
Derivative Time	der.t	25
Derivative Approach	DAC	1.5
Cycle Time	cyc.t	1.5
Offset (Manual Reset)	ofSt	1.0
Setpoint Lock	SP.LK	off
Setpoint Ramp Rate	Sprr	0
Ramp on off or hold	Sprn	off
Soak	Soak	--
NOTE 1 Adj. SP2 ± Sensor Full Scale	Set.2	1125
SP2 Hysterisis	bnd.2	2.0
SP2 Cycle	cyc.2	on. off

LEVEL 2		
DESCRIPTION	Config Code	Setting
Read SP1 Output %	SP1.P	100
SP1 Manual Output %	hand	oFF
SP1 Output % Limit	PL.1	100
SP2 Output % Limit	PL.2	100
Main SP2 Mode	SP2.A	FS.hi
Second SP2 Mode	SP2.b	nL.In
Display Resolution	diSP	1
Set Scale Max	hi.Sc	1100
Set Scale Min	Lo.Sc	0
Select Input Sensor	InPt	tc K
Select Display Units	Unit	c

FIRMWARE REV. ______

PC SOFTWARE REV. ______

LEVEL 3		
DESCRIPTION	Config Code	Setting
SP1 Output Device	SP1.D	SSd
SP2 Output Device	SP2.d	rLy
Sensor Burn-Out	bUrn	UP.Sc
Reverse Outputs	rEUd	1r.2d
Reverse Output LED's	rEU.L	1n2n
Span Adjustment	SPAn	0.0
Zero Adjustment	ZEro	0.0
Set Monitor	chEK	oFF
Read Monitor	rEAd	uAr
Read Tune Data	tEch	ctA
Software Version	uEr	941 **
Reset	rSEt	nonE

LEVEL 4		
DESCRIPTION	Config Code	Setting
Derivitive Sensitivity	dEr.5	0.5
Display Averaging	dI.SS	dIr
Disable -AL- alarm display; on	no.AL	on
Disable program auto-exit	ProG	AUto
Security Lock	LocK	nonE
Change Prog Entry Point	Set.L	oFF

LEVEL C		
DESCRIPTION	Config Code	Setting
Instrument Address	Addr	1
Baud Rate	bAUd	9600
Data Format	dAtA	18n1
Tx Rx Activity	dbUc	oFF

1: SET LAST AFTER COMPLETE CONFIGURATION IS FINISHED

REV	ECR NO.	[ZONE] DESCRIPTION	DATE
B	46163	ADDED NOTE 1 LEVEL 1 SETPOINT LOACK WAS SP.LH LEVEL 3 SET MONITOR WAS chEH	DW 8/31/04
A	43139	ADDED DAC PARAMETER SP.LH CHGD TO SP.LK SP1.P WAS read only	JJS 11/19/02

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES. TOLERANCES: ANGLES ± 1° 2 PLACE DECIMALS ± .060 3 PLACE DECIMALS ± .030

DO NOT SCALE THIS DRAWING

◇ DENOTES CRITICAL DIMENSIONS

MATERIAL: N/A

DRAWN	JJS	8/22/02
CHECKED		
APPROVED		
RELEASED	41568	

Kendro

KENDRO LABORATORY PRODUCTS, INC
275 AIKEN ROAD
ASHEVILLE, NC 28804

TITLE

CONTROLLER CONFIG CAL 9400

SIZE B | DWG. NO. 311465102

SCALE NONE | DIST. QC | SHEET 1 of 1

PRO-E Format rev. 01\15\03

311465103

9500

RS232 COMM SETTINGS

COMM DEVICE:COM3
DATA RATE:9600
PARITY:NONE

LEVEL 1

	DESCRIPTION	Config Code	Setting
	Autotune or Park	tune	off
	SP1 Proportional Band	band	10
	Integral Time	Int.t	5
	Derivative Time	der.t	25
	Derivative Approach	DAC	1.5
	Cycle Time	cyc.t	1.5
	Offset (Manual Reset)	ofSt	0
	Setpoint Lock	Sp.Lk	off
NOTE 1	Adj. SP2 ± Sensor Full Scale	Set.2	1125
	SP2 Hysterisis	bnd.2	2.0
	SP2 Cycle	cyc.2	on. off

LEVEL 3

	DESCRIPTION	Config Code	Setting
NOTE 1	SP1 Output Device	SP1.D	SSd
NOTE 1	SP2 Output Device	SP2.d	rLy
	Sensor Burn-Out	bUrn	UP.Sc
	Reverse Outputs	rEUd	1r.2d
	Reverse Output LED's	rEU.L	1n2n
	Span Adjustment	SPAn	0.0
	Zero Adjustment	ZEro	0.0
	Set Monitor	chEH	oFF
	Read Monitor	rEAd	(00)
	Read Tune Data	tEch	(0.0)
	Software Version	uEr	941
	Reset	rSEt	nonE

LEVEL C

DESCRIPTION	Config Code	Setting
Instrument Address	Addr	1
Baud Rate	bAUd	9600
Data Format	dAtA	18n1
Tx Rx Activity	dbUc	oFF

LEVEL P

DESCRIPTION	Config Code	Setting
Program Number 1 TO 31	ProG	Program Specific - See Program Worksheet
Run Program	rUn	
Power Failure Recovery Mode	FAIL	
Program Start Value	St. u	
Setpoint Ramp Time Units	SPru	
Segment Number (1 to 126)	SEG	
Define Segment Type	tYPE	
Setpoint Ramp Rate	SPrr	
Adjust Target Setpoint	t.SP	
Holdback Value	hb. U	
Event Output	Eo. P	

LEVEL 2

	DESCRIPTION	Config Code	Setting
NOTE 2	Read SP1 Output %	SP1.P	100
	SP1 Manual Output %	hand	oFF
	SP1 Output % Limit	PL.1	100
	SP2 Output % Limit	PL.2	100
	Main SP2 Mode	SP2.A	FS.hI
	Second SP2 Mode	SP2.b	nL.In
	Display Resolution	diSP	1
	Set Scale Max	hI.Sc	1100
	Set Scale Min	Lo.Sc	0
NOTE 3	Select Input Sensor	InPt	tc K
	Select Display Units	Unlt	c

LEVEL 4

DESCRIPTION	Config Code	Setting
Derivitive Sensitivity	dEr.5	0.5
Display Averaging	dI.SS	dIr
Disable -AL- alarm display; on	no.AL	on
Disable program auto-exit	ProG	AUto
Security Lock	LocK	nonE
Change Prog Entry Point	Set.L	oFF

LEVEL A

Level A parameters are irrelevant as input is non scaled

NOTE 1: TURNS HEAT OFF

NOTE 2: SET AFTER FULL CONFIGURED

NOTE 3: SET THIS ON NEW STARTUP BEFORE CONFIGURING

FIRMWARE REV. ______

PC SOFTWARE REV. ______

REV	ECR NO.	[ZONE] DESCRIPTION	DATE
B	46163	ADDED NOTES LEVEL 1 SETTING OFFSET WAS 1.0 LEVEL 2 SETTING READ SP1 OUTPUT WAS 0 LEVEL 3 READ MONITOR SETTING WAS UAC READ TUNE DATA SETTING WAS CIA	DW 8/31/04

THIRD ANGLE PROJECTION

Kendro

KENDRO LABORATORY PRODUCTS, INC
275 AIKEN ROAD
ASHEVILLE, NC 28804

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES. TOLERANCES: ANGLES ± 1°
2 PLACE DECIMALS ± .060
3 PLACE DECIMALS ± .030

DO NOT SCALE THIS DRAWING

◇ DENOTES CRITICAL DIMENSIONS

MATERIAL: N/A

TITLE: CONTROLLER CONFIG CAL 9500p

DRAWN	JJS	8/22/02
CHECKED		
APPROVED		
RELEASED	41568	

SIZE B | DWG. NO. 311465103

SCALE NONE | DIST. QC | SHEET 1 of 1

PRO-E Format rev. 01/15/03

3300

311465104

HOLD IN △ & ▽ FOR PROGRAM MODE

NOTE 1

LEVEL 1		
DESCRIPTION	Config Code	Setting
Autotune or Park	tune	off
SP1 Proportional Band	band	0.1
Integral Time	Int.t	5
Derivative Time	der.t	25
SP1 Derivative Approach	dAC	1.5
Cycle Time	cyc.t	1.5
Offset (Manual Reset)	ofSt	0
Setpoint Lock	SP.LK	off
Setpoint Ramp Rate	Sprr	0
Ramp on off or hold	Sprn	off
Soak	Soak	--
Adj. SP2 ± Sensor Full Scale	Set.2	0
SP2 Hysterisis	bnd.2	2.0
SP2 Cycle	cyc.2	on. off

LEVEL 2		
DESCRIPTION	Config Code	Setting
Read SP1 Output %	SP1.P	100
SP1 Manual Output %	hand	oFF
SP1 Output % Limit	PL.1	100
SP2 Output % Limit	PL.2	100
Main SP2 Mode	SP2.A	DEV.hI
FUN2	SP2.b	Auto
Display Resolution	diSP	1
Set Scale Max	hI.Sc	1100
Set Scale Min	Lo.Sc	0
Select Input Sensor	InPt	tc K
Select Display Units	Unit	c

FIRMWARE REV. _____

PC SOFTWARE REV. _____

NOTE 2

LEVEL 3		
DESCRIPTION	Config Code	Setting
SP1 Output Device	SP1.D	SSd
SP2 Output Device	SP2.d	rLy
Sensor Burn-Out	bUrn	UP.Sc
Reverse Outputs	rEUd	1r.2d
Reverse Output LED's	rEU.L	1.2n
Span Adjustment	SPAn	0.0
Zero Adjustment	ZEro	0.0
Set Monitor	chEH	oFF
Read Monitor	rEAd	uAr
Read Tune Data	tEch	ctA
Software Version	uEr	GUS
Reset	rSEt	nonE

LEVEL 4		
DESCRIPTION	Config Code	Setting
Derivitive Sensitivity	dEr.5	0.5
Display Averaging	dI.SS	dIr
Disable -AL- alarm display; on	no.AL	oFF
Disable program auto-exit	ProG	AUto
Security Lock	LocK	NONE
Change Prog Entry Point	Set.L	oFF

LEVEL C FOR UNITS WITH COMMUNICATION

LEVEL C		
DESCRIPTION	Config Code	Setting
Instrument Address	Addr	1
Baud Rate	bAUd	9600
Data Format	dAtA	18n1
Tx Rx Activity	dbUc	oFF

NOTE 1: IF DISPLAY IS LOCKED, GO TO LEVEL 1 "TUNE" & TURN PARK OFF

NOTE 2: TURN OUTPUT LED OFF

REV	ECR NO.	DESCRIPTION	DATE
C	46163	ADDED NOTES, UPDATED SETTING INFORMATION	9/1/04 DW
B	44012	LEVEL 1 SP1-PB WAS 10 LEVEL 3 REV OUTPUT WAS IN2M	5/21/03

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES. TOLERANCES: ANGLES ± 1° 2 PLACE DECIMALS ± .060 3 PLACE DECIMALS ± .030

DO NOT SCALE THIS DRAWING

◇ DENOTES CRITICAL DIMENSIONS

MATERIAL:

DRAWN	JJS	11/1/02
CHECKED		
APPROVED		
RELEASED	42110	

Kendro

KENDRO LABORATORY PRODUCTS, INC
275 AIKEN ROAD
ASHEVILLE, NC 28804

TITLE

CONTROLLER/OTC CONFIG CAL 3300

SIZE B | DWG. NO. 311465104

SCALE NONE | DIST. | SHEET 1 of 1

PRO E Format rev. 01115103

Thermo
ELECTRON CORPORATION

Thermo Electron Corporation
Registered to ISO 9001
File Number A8190

EC Declaration of Conformity

We, Thermo Electron Corporation
275 Aiken Road
Asheville, N.C. 28804

declare under sole responsibility that the following laboratory freezer model(s):

CBFS516C, CBFS517C, CBFS518C, CBFM516C, CBFM517C, CBFM518C, CBFL516C, CBFL517C and CBFL518C

manufactured beginning in the year 2002, are in conformity, to the best of our knowledge, with the following EC standards and other normative documents;

1) **EC EMC Directive 89/336/EEC** - Essential health and safety requirements relating to electromagnetic compatibility. Specifically:

   a) EN 61326-1:1997/A1:1998/EN 55011:1991 Conducted Emissions class A, Radiated Emissions class A and B.

   b) EN 61326-1:1997/A1:1998, Annex A, Immunity requirements.

2) **Low Voltage Directive 73/23/EEC** - Harmonization of laws relating to electrical equipment design for use within certain voltage limits. Specifically:

   a) EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use.

The CE mark , below, is affixed to the device according to the CE Marking Directive 93/68/EEC.

CE

3/2/2006
Date

Steve Hodges
<<Representative Signature>>

WEEE Compliance

Great Britain

WEEE Compliance. This products is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96EC. It is marked with the following symbol. Thermo Scientific has contracted with one or more recycling/disposal companies in each EU Member State, and this products should be disposed of or recycling through them. Further information on Thermo Scientific's compliance with these Directives, the recyclers in your country, and information on Thermo Scientific products which may assist the detection of substances subject to the RoHS Directive are available at **www.thermo.com/WEEERoHS**

Deutschland

WEEE Konformittät. Dieses Produkt muss die EU Waste Electrical & Electronic Equipment (WEEE) Richtlinie 2002/96EC erfüllen. Das Produkt ist durch folgendes Symbol gekennzeichnet. Thermo Scientific hat Vereinbarungen getroffen mit Verwertungs-/Entsorgungsanlagen in allen EU-Mitgliederstaaten und dieses Produkt muss durch diese Firmen widerverwetet oder entsorgt werden. Mehr Informationen über die Einhaltung dieser Anweisungen durch Thermo Scientific, die Verwerter und Hinweise die Ihnen nützlich sein können, die Thermo Scientific Produkte zu identizfizieren, die unter diese RoHS Anweisung fallen, finden Sie unter **www.thermo.com/WEEERoHS**

Italia

Conformità WEEE. Questo prodotto deve rispondere alla direttiva dell'Unione Europea 2002/96EC in merito ai Rifiuti degli Apparecchi Elettrici ed Elettronici (WEEE). È marcato col seguente simbolo. Thermo Scientific ha stipulato contratti con una o diverse società di riciclaggio/smaltimento in ognuno degli Stati Membri Europei. Questo prodotto verrà smaltito o riciclato tramite queste medesime. Ulteriori informazioni sulla conformità di Thermo Scientific con queste Direttive, l'elenco delle ditte di riciclaggio nel Vostro paese e informazioni sui prodotti Thermo Scientific che possono essere utili alla rilevazione di sostanze soggette alla Direttiva RoHS sono disponibili sul sito **www.thermo.com/WEEERoHS**

France

Conformité WEEE. Ce produit doit être conforme à la directive européenne (2002/96EC) des Déchets d'Equipements Electriques et Electroniques (DEEE). Il est merqué par le symbole suivant. Thermo Scientific s'est associé avec une ou plusieurs compagnies de recyclage dans chaque état membre de l'union européenne et ce produit devrait être collecté ou recyclé par celles-ci. Davantage d'informations sur la conformité de Thermo Scientific à ces directives, les recycleurs dans votre pays et les informations sur les produits Thermo Scientific qui peuvent aider le détection des substances sujettes à la directive RoHS sont disponibles sur **www.thermo.com/WEEERoHS**

Important

For your future reference and when contacting the factory, please have the following information readily available:

Model Number: _____

Serial Number: _____

The above information can be found on the dataplate attached to the equipment. If available, please provide the date purchased, the source of purchase (Lindberg/Blue M or specific agent/rep organization), and purchase order number.

IF YOU NEED ASSISTANCE:

SALES DIVISION

Phone:	828/658-2711 800/252-7100
FAX:	828/645-3368

LABORATORY PARTS and SERVICE

Phone:	828/658-2891 800/438-4851
FAX:	828/658-2576

TECHNICAL SUPPORT

Phone:	800/438-4851